AF/2834 $

PATENT
2565-0225P

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of		Before the Board of Appeals	
Shusou WADAKA, et al.		Appeal No.:	
Appl. No.:	09/778,872	Group:	2834
Filed:	February 8, 2001	Examiner:	M. BUDD
For:	FILM ACOUSTIC WAVE DEVICE AND ITS MANUFACTURING METHOD AND CIRCUIT DEVICE		

APPEAL BRIEF TRANSMITTAL FORM

Assistant Commissioner for Patents
Washington, D.C. 20231:

March 10, 2003

Sir:

Transmitted herewith is an Appeal Brief (in triplicate) on behalf of the Appellants in connection with the above-identified application.

☐ The enclosed document is being transmitted via the Certificate of Mailing provisions of 37 C.F.R. 1.8.

A Notice of Appeal was filed on January 9, 2003.

☐ Applicant claims small entity status in accordance with 37 C.F.R. § 1.27

The fee has been calculated as shown below:

☐ Extension of time fee pursuant to 37 C.F.R. §§ 1.17 and 1.136(a) -

☒ Fee for filing an Appeal Brief - $320.00 (large entity).

☒ Check(s) in the amount of $320.00 is(are) attached.

☐ Please charge Deposit Account No. 02-2448 in the amount of $0.00. A triplicate copy of this sheet is attached.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By ______________________
Michael K. Mutter, #29,680

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

RWO
MKM/CJB:cb
2565-0225P

PATENT
2565-0225P

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of

Shusou WADAKA, et al.

Appl. No.: 09/778,872

Filed: February 8, 2001

For: FILM ACOUSTIC WAVE DEVICE AND ITS MANUFACTURING METHOD AND CIRCUIT DEVICE

Before the Board of Appeals

Appeal No.:

Group: 2834

Examiner: M. Budd

Docket No. 2565-0225P

Application No. 09/778,872

PATENT
2565-0225P

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of

Shusou WADAKA, et al.

Appl. No.: 09/778,872

Filed: February 8, 2001

For: FILM ACOUSTIC WAVE DEVICE AND ITS MANUFACTURING METHOD AND CIRCUIT DEVICE

Before the Board of Appeals

Appeal No.:

Group: 2834

Examiner: M. Budd

TABLE OF CONTENTS

Page No.

PATENT
2565-0225P

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of	Before the Board of Appeals
Shusou WADAKA, et al.	Appeal No.:
Appl. No.: 09/778,872	Group: 2834
Filed: February 8, 2001	Examiner: M. Budd

For: FILM ACOUSTIC WAVE DEVICE AND ITS MANUFACTURING METHOD AND CIRCUIT DEVICE

BRIEF FOR APPELLANT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This appeal is from the Final Office Action of the Primary Examiner dated October 9, 2002, finally rejecting claims 24-40, 61, and 62, which are reproduced as an Appendix to this brief. This brief is being filed in triplicate with the requisite fee.

The commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17 and 1.21 that may be required by this paper, and to credit any overpayment, to deposit account 02-2448.

I. Real Party in Interest

The named inventors have assigned their rights to the invention that is disclosed in the application and any patent that may issue therefrom to

Mitsubishi Denki Kabushiki Kaisha, as recorded in the Patent and Trademark Office at Reel 9925, Frame 0240.

II. Related Appeals and Interferences

The parent application Serial No. 09/202,070 is also on appeal before the Board.

III. Status of the Claims

Claims 17-62 are currently pending in the application. Claims 17-23 and 41-60 have been withdrawn from consideration. Claims 24-40, 61, and 62 are rejected and are the subject of the appeal. Claim 24 is the sole independent claim of the subject of the appeal.

IV. Status of Amendments

There was one response filed January 2, 2003 subsequent to the final rejection.

V. Summary of the Invention

The present invention pertains to a wafer produced in the process of forming a plurality of acoustical wave devices, and the process of forming the wafer containing acoustical wave devices. In the production of the acoustical wave devices variations of the type of material and the size of the material (i.e. thickness, length) will change the operation of the acoustic wave device and specifically the frequency ranges achieved by each device. Since the acoustical

wave devices are produced on a micro scale, a plurality of these devices may be produced on a single wafer. Commonly in the production of devices using semiconductor device fabrication technology, variations in the material, particularly thickness of the material, are generally observed in relation to the location of the device on the wafer. For example, due to the application techniques of metal layers (called sputtering), these layers are thicker towards the center of the wafer and become thinner towards the edge of the wafer.

In the production of the acoustic wave devices it is desirable to produce devices located on the same wafer so that each of these devices operate at the same frequency range. However, because of the variations in material, as discussed above, the frequency ranges vary depending on where the acoustical wave device is located on the wafer. Adjusting the material thickness at the different locations for the devices which are not producing the correct frequency range, becomes very costly and burdensome. Therefore, according to the present invention, the variation of thickness is compensated for by modifying a characteristic of the pattern shape of the acoustical wave devices during the production process, dependent upon where the acoustical wave devices are located on the wafer.

Therefore, appellants recite a product formed by the process in claim 24, a wafer having a plurality of acoustical wave devices formed thereon and exhibiting common operational characteristics, each of said acoustical wave devices manufactured according to a method comprising: forming a ground

electrode on the wafer which is intended to be placed on top of a semiconductor substrate; forming a piezoelectric thin film on top of the ground electrode, wherein the piezoelectric thin film varies in at least one characteristic across the wafer; and forming at least one upper electrode on top of the piezoelectric thin film, wherein at least the ground electrode, the piezoelectric thin film and the at least one upper electrode form components, as a result of steps (a)-(c), in each of the plurality of acoustical wave devices, and wherein at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer.

An aspect of the present invention may be gleaned from Figs. 1-3 in which the width (*We*, *Wa*) and length (*Le*, *La*, *Lg*) of the various components that comprise the acoustical wave device are illustrated and varied depending on where the acoustical wave device is positioned on the wafer. As an example of different pattern changes, the bonding pads connected to the upper electrodes of the acoustic wave devices in the center of the wafer may be longer than the bonding pads of acoustical at the edge of the wafer. Further, the upper electrodes may be narrower on the acoustical wave devices in the center of the wafer than the upper electrodes of acoustical wave devices at the edge of the wafer. Thus, a higher yield of acoustical wave devices having the same frequency characteristics is achieved.

VI. The Issues

The final Office Action presents four issues for review on Appeal.

1. Whether claims 24-33 and 40 are properly rejected under 35 U.S.C. § 102(a) as being anticipated by Krishnaswamy (U.S. Patent No. 5,185,589).
2. Whether claims 24-33 and 40 are properly rejected under 35 U.S.C. § 102(a) as being anticipated by Curran (U.S. Patent No. 3,401,275).
3. Whether claims 24-33 and 40 are properly rejected under 35 U.S.C. § 102(a) as being anticipated by Vale et al. (U.S. Patent No. 5,194,836).
4. Whether claims 24-33 and 40 are properly rejected under 35 U.S.C. § 102(a) as being anticipated by Japanese Patent Application No. 5-259804.
5. Whether claim 34 is properly rejected under 35 U.S.C. 103(a) as being unpatentable over JP 5-259804 in view of Berlincourt et al. (U.S. Patent No. 3,676,724).
6. Whether claim 34 is properly rejected under 35 U.S.C. 103(a) as being unpatentable over Vale et al. (U.S. Patent No. 5,194,836) in view of Berlincourt et al. (U.S. Patent No. 3,676,724).
7. Whether claim 34 is properly rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnaswamy (U.S. Patent No. 5,575,318) in view of Berlincourt et al. (U.S. Patent No. 3,676,724).
8. Whether claims 35-39, 61, and 62 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Krishnaswamy (U.S. Patent No. 5,185,589).

9. Whether claims 35-39, 61, and 62 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Curran (U.S. Patent No. 3,401,275).
10. Whether claims 35-39, 61, and 62 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Vale et al. (U.S. Patent No. 5,194,836).
11. Whether claims 35-39, 61, and 62 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent Application No. 5-259804.

VII. Grouping of the Claims

For purpose of this appeal, Appellants consider the claims to not stand or fall together. Each claim is argued independently.

VIII. Argument

A. The References Relied Upon in the Rejection

1. Krishnaswamy et al. (U.S. Patent No. 5,185,589)

The Krishnaswamy reference pertains to a film bulk acoustic resonator. The bulk resonator is a series of three acoustic resonators located next to each other. It is designed to eliminate the need for wire bonds that are usually provided to attach the bulk resonator to associated circuitry. Krishnaswamy accomplishes this by using a coplanar transmission line configuration which also provides means for grounding the bulk resonator. The configuration utilizes

ground plane strips and via holes at appropriate positions in the ground plane strips in its design. Thus, a true ground connection to the resonator is provided without the need for vias passing through the substrate.

2. <u>Curran et al. (U.S. Patent No. 3,401,275)</u>

The Curran reference pertains to piezoelectric resonators for use in high frequency filter circuits. The resonator (e.g., Figures 1 and 2) utilizes a piezoelectric driving element 18 which is less than one-half the wavelength of the operational frequency (column 1, lines 69-72). The resonator is constructed on a wafer 12. The resonator has a bottom electrode formed on the wafer, the piezoelectric driving element formed on the bottom layer and an upper electrode formed on the driving element. The change in the thickness of the piezoelectric driving element provides for high frequency operation, allows for operation at even and odd harmonics and mass loads the active region of the resonator (column 1, lines 54-72).

3. <u>Vale et al. (U.S. Patent No. 5,194,836)</u>

The Vale reference pertains to a miniature thin film filter device. The thin film device is made up of a number of resonators each having the same structure. The resonator

structure provides for a bottom electrode, a piezoelectric layer formed on the bottom electrode and an upper electrode formed on the piezoelectric material. The resonators are formed in rows in which the resonators are connected in cascade. The rows of resonators are connected in parallel to adjacent rows thus forming the high frequency filter bank. The ability to make the filters on a small scale allows for the filters to be manifolded without utilizing manifolding circuitry which usually cause significant filter losses.

4. Japanese Patent Application No. 5-259804

The JP 5-259804 reference pertains to an ultra thin plate multi-stage cascade connection of multiplex mode filters. Divided electrodes, which are formed on a plate oscillation portion, are varied in shape, including height and length. The shape of the electrodes is chosen based on the spurious radiation pattern in each of the divided electrodes. When the optimal radiation pattern is achieved, the radiation patterns of the divided electrodes will cancel each other minimizing the spurious radiation levels.

B. The Final Office Action

The Final Office Action is responsive to an Amendment filed August 23, 2002. However, for the following reasons, Appellants arguments herein are based on a less than complete understanding of the position taken in the Final

Office Action. In that Amendment, and in particular in the amendment to claim 24, Appellants had amended the claims from the perspective of an acoustic wave device to the perspective of a wafer used in the production of a plurality of acoustic wave devices. The change in perspective was made in order to emphasize the crux of the present invention as being the established relationship of an operational characteristic of a component of some of the acoustical wave devices to a characteristic of the piezoelectric film depending on the location of an acoustical wave device on the wafer, set during the production of the acoustical wave devices. The Final Office Action merely directs Appellants attention to the rejections made in the previous Office Action, pertaining to an acoustical wave device, as if the claims had not been amended to recite a wafer. Thus, Appellants submit that the Final Office Action apparently overlooks that the claims have been amended to the alternative perspective, or at least fails to address the limitations in the amended claims.

Further, the rejections under 35 U.S.C. 102 are stated in terms of "clearly anticipated." According to 37 C.F.R. 1.104(c)(2), "When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified." The references relied on in the rejections each are complex and/or describe inventions other than that claimed

by Applicants. Thus, Applicants submit that the rejections do not make clear the particular part relied on in each of the respective references.

Finally, the Office Action of May 28, 2002 ignores the process steps in the product-by-process claims. Specifically, the Office Action admits that the references relied on in the rejections "don't necessarily teach the method steps used to claim structures." Relying on In re Thorpe, it further states that, "in product-by-process claims it is the product that must stand or fall on its own merits" and "method steps are irrelevant to the patentability of the article even in product-by-process claims." Applicants submit that Thorpe does not stand for the principle that the process must be ignored when examining product-by-process claims. Rather, as discussed in the MPEP 806.05(f), Thorpe teaches that product-by-process claims are limited by and defined by the process. In other words, in the case of the present invention the process leading to the claimed wafer defines the resulting wafer. Thus, Applicants submit that the Office Action never addresses the claimed process steps.

Summary of Argument

At the outset, even though the rejections made in the Office Action, and carried over into the Final Office Action, were made based on the "clearly anticipated" standard, none of the references relied on disclose a wafer. All of the claims, starting with the sole independent claim 24, are specifically limited

to "A/The wafer." Thus, at least for this reason, Appellants submit that the references fail to "clearly anticipate" the claimed invention.

The claimed invention is directed to a wafer produced in producing a plurality of acoustic wave devices, and the manufacturing process steps in producing the wafer. As has been previously stated, in producing acoustic wave devices, variations in characteristics occur throughout a wafer during the manufacturing process. Such variations lead to variations in operational characteristics of acoustic wave devices formed on the wafer. The present invention solves this problem by establishing the characteristic of a component of the acoustic wave devices during the manufacturing process. In particular, in forming one of ground electrode, piezoelectric thin film, and upper electrode, in the production of a wafer, an operational characteristic of that component, e.g., length or width, in some of the acoustic wave devices is modified based on the location of the acoustic wave device on the wafer. The component is modified to compensate for the variation in at least one characteristic, e.g., thickness, of the piezoelectric thin film. The claimed product is a resulting wafer produced from the formation steps.

Appellants submit that none of the references relied on in the Final Office Action teach or suggest, in the production of a plurality of acoustic wave devices, producing a wafer by forming at least one component to have a modified operational characteristic that compensates for a variation in a

characteristic of the piezoelectric thin film based on the location of the acoustic wave device on the wafer. Representative claim 24 recites steps in producing the wafer including "forming a ground electrode," "forming a piezoelectric thin film," and "forming at least one upper electrode." The claim further establishes that each of the electrodes and film are components, and that in any of the forming steps at least one component in some of the acoustic wave devices is modified in its operational characteristics to compensate for the variation in a characteristic of the piezoelectric thin film based on the location of the acoustic device on the wafer. The resulting wafer has component characteristics that have been modified during the manufacturing process to compensate for variation in a characteristic of the piezoelectric thin film and that are based on the location of the acoustic wave device on the wafer. Another key difference between the references relied on in the Final Office Action and the present invention is that in the present invention characteristics of acoustic wave devices in a wafer had been pre-defined and set during the manufacturing process, whereas devices disclosed in the references will have characteristics that vary arbitrarily based on the usual manufacturing tolerances. The claimed product-by-process recites this timing in the formation of the product in order to define what is meant by a "modified" operational characteristic. None of the references disclose an operational characteristic of a component that has been "modified" according to the definition that applies within the context of the

claimed invention. Accordingly, Appellants submit that at least for this additional reason, none of the references relied on the Final Office Action "clearly anticipate" the claimed invention of claim 24.

Furthermore, the Final Office Action does not specifically address the dependent claims. Thus, at least based on a lack of argument in the Final Office Action, Appellants submit that the rejections fail to render the dependent claims anticipated by, or obvious over, the references relied on.

C. Requirements for *Prima Facie* Anticipation

Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. RCA Corp. v. Applied Digital Data Sys., Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir.); cert. Dismissed, 468 U.S. 1228 (1984); W.L. Gore and Assoc., Inc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983), cert. Denied, 469 U.S. 851 (1984).

D. Claim 24 is not properly rejected under 35 U.S.C. § 102(a) as being anticipated by Krishnaswamy.

The Final Office Action states that claim 24 (as amended) is "clearly anticipated" by Krishnaswamy, but directs Appellants attention to the response set forth in the Office Action of May 29, 2002. Also, in a further pertinent

comment, the Final Office Action states, "a wafer containing a pass band filter will have several different frequencies on that wafer." The May 29, 2002 Office Action does not go into detail with respect to claimed elements.

Claim 24 is directed to a "wafer" having a plurality of acoustic wave devices formed thereon and exhibiting common operational characteristics. Each of the acoustical wave devices comprises a ground electrode on top of a semiconductor substrate, a piezoelectric thin film on top of the ground electrode, and at least one upper electrode on top of the piezoelectric thin film, wherein at least the ground electrode, the piezoelectric thin film and the at least one upper electrode form components of the acoustical wave devices. In particular, the claim recites a dependency between an operational characteristic of at least one component in some of the plurality of acoustical wave devices (e.g., length or width of an electrode) and a variation in the at least one characteristic of the piezoelectric thin film (e.g., thickness), based on the location of the acoustical wave device on the wafer. Appellants submit that Krishnaswamy fails to teach or suggest at least a wafer having a plurality of acoustic wave devices.

Krishnaswamy is directed to a completed film bulk acoustic resonator. Krishnaswamy does not disclose a wafer of, for example, film bulk acoustic resonators. Thus, Appellants submit that at least for this reason, the rejection does not establish *prima facie* anticipation of claim 24.

Furthermore, Appellants submit that Krishnaswamy fails to teach or suggest at least the claimed limitation of, "at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer."

The Krishnaswamy reference teaches a film bulk acoustic resonator (Krishnaswamy: Abstract) which is configured as a coplanar transmission line structure. An embodiment in Krishnaswamy discloses a series manifold filter circuit containing a plurality of interconnected resonators formed on a substrate (e.g., FBAR's 60, 60', and 60" formed on substrate 57 shown in Figures 6, 7, and 7A). Each resonator is identical, in that they each have the same characteristics and dimensions of features. Krishnaswamy is silent with respect to accommodating for variations in the, for example, thickness of the piezoelectric thin film caused during manufacturing. In the present claimed invention, on the other hand, the variation in at least one characteristic of the piezoelectric thin film is compensated for by a modified operational characteristic of at least one component in some of the acoustical wave devices, based on the location of the acoustical device on the wafer. The modified operational characteristic of the component is made in forming the component in the production of a wafer. Krishnaswamy fails to teach or suggest this

limitation in the context claimed. Accordingly, Appellants submit that Krishnaswamy fails to teach or suggest each and every claimed element.

E. <u>Claim 24 is not properly rejected under 35 U.S.C. § 102(a) as being anticipated by Curran et al.</u>

The Final Office Action states that claim 24 (as amended) is "clearly anticipated" by Curran et al., but directs Appellants attention to the response set forth in the Office Action of May 29, 2002. Also, in a further pertinent comment, the Final Office Action states, "a wafer containing a pass band filter will have several different frequencies on that wafer." The May 29, 2002 Office Action does not go into detail with respect to claimed elements.

Appellants submit that Curran fails to teach or suggest a wafer having a plurality of acoustic wave devices formed thereon. In addition, Appellants submit that Curran fails to teach or suggest a wafer having a plurality of acoustic wave devices and exhibiting common operational characteristics, "wherein at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer."

Curran is directed to a completed composite resonator. Curran does not disclose a wafer of, for example, composite resonators. Thus, Appellants submit

that at least for this reason, the rejection does not establish *prima facie* anticipation of claim 24.

Furthermore, the Curran reference teaches a composite multi-resonator structure (Figure 8). In the multi-resonator structure, 3 spaced piezoelectric driving elements 26 are each formed on a substrate 24. Each driving element is provided with electrodes 28 and 30. The bottom electrodes 30 are provided with interconnected leads 32 to form a predetermined circuit configuration (column 5, lines 31-45). Each piezoelectric driving element is identical (e.g., each is of the configuration of Figures 1 and 2). Curran is silent with respect to accommodating for variations in the, for example, thickness of the piezoelectric thin film caused during manufacturing. In the present claimed invention, on the other hand, the variation in at least one characteristic of the piezoelectric thin film is compensated for by a modified operational characteristic of at least one component in some of the acoustical wave devices, based on the location of the acoustical device on the wafer. The modified operational characteristic of the component is made in forming the component in the production of a wafer. Curran fails to teach or suggest this limitation in the context claimed. Accordingly, Appellants submit that Curran fails to teach or suggest each and every claimed element.

F. Claim 24 is not properly rejected under 35 U.S.C. § 102(a) as being anticipated by Vale et al.

The Final Office Action states that claim 24 (as amended) is "clearly anticipated" by Vale, but directs Appellants attention to the response set forth in the Office Action of May 29, 2002. Also, in a further pertinent comment, the Final Office Action states, "a wafer containing a pass band filter will have several different frequencies on that wafer." The May 29, 2002 Office Action does not go into detail with respect to claimed elements.

Appellants submit that Vale fails to teach or suggest a wafer having a plurality of acoustic wave devices formed thereon. In addition, Appellants submit that Vale fails to teach or suggest a wafer having a plurality of acoustic wave devices and exhibiting common operational characteristics, "wherein at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer."

Vale is directed to a completed microwave frequency acoustic filter device comprising acoustic resonators. Vale does not disclose a wafer of, for example, acoustic filter devices. Thus, Appellants submit that at least for this reason, the rejection does not establish *prima facie* anticipation of claim 24.

Furthermore, the Vale reference teaches a three-pole filter device having acoustic resonators 15, 20, and 25 (e.g., Figures 1 and 2). Each of the

resonators 15, 20, and 25 is formed on a dielectric membrane 30. Each acoustic resonator is identical and interconnected (column 2, lines 31-33). Vale is silent with respect to accommodating for variations in the, for example, thickness of the piezoelectric material caused during manufacturing. In the present claimed invention, on the other hand, the variation in at least one characteristic of the piezoelectric thin film is compensated for by a modified operational characteristic of at least one component in some of the acoustical wave devices, based on the location of the acoustical device on the wafer. The modified operational characteristic of the component is made in forming the component in the production of a wafer. Vale fails to teach or suggest this limitation in the context claimed. Accordingly, Appellants submit that Vale fails to teach or suggest each and every claimed element.

G. Claim 24 is not properly rejected under 35 U.S.C. § 102(a) as being anticipated by Japanese Pat. App. No. 5-259804.

The Final Office Action states that claim 24 (as amended) is "clearly anticipated" by Japanese Pat. App. No. 5-259804, but directs Appellants attention to the response set forth in the Office Action of May 29, 2002. Also, in a further pertinent comment, the Final Office Action states, "a wafer containing a pass band filter will have several different frequencies on that wafer." The May 29, 2002 Office Action does not go into detail with respect to claimed elements.

Appellants submit that JP 5-259804 fails to teach or suggest a wafer having a plurality of acoustic wave devices formed thereon. In addition, Appellants submit that JP 5-259804 fails to teach or suggest a wafer having a plurality of acoustic wave devices and exhibiting common operational characteristics, "wherein at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer."

JP 5-259804 is directed to a completed multi-stage cascade connection multiplex mode filter. JP 5-259804 does not disclose a wafer of, for example, multiplex mode filters. Thus, Appellants submit that at least for this reason, the rejection does not establish *prima facie* anticipation of claim 24.

Furthermore, the JP 5-259804 reference teaches a multi-stage cascade connection multiplex mode filter. Divided electrodes (5) and (5') formed on the plate oscillation portion (2) have different shapes (e.g., as shown in Figures 1(a) and (b)). The attenuation characteristics of these multiplex mode filter elements are different from each other as depending on the shape of the divided electrode. Thus, the two filter elements connected in cascade cancel each other out. JP 5-259804 is silent with respect to accommodating for variations in the, for example, thickness of the piezoelectric material caused during

manufacturing. In the present claimed invention, on the other hand, the variation in at least one characteristic of the piezoelectric thin film is compensated for by a modified operational characteristic of at least one component in some of the acoustical wave devices, based on the location of the acoustical device on the wafer. The modified operational characteristic of the component is made in forming the component in the production of a wafer. JP 5-259804 fails to teach or suggest this limitation in the context claimed. Accordingly, Appellants submit that JP 5-259804 fails to teach or suggest each and every claimed element.

Therefore, a reversal of the rejection of claim 24 under 35 U.S.C. § 102 should be granted.

H. Features of the Dependent Claims are also not taught by Krishnaswamy, Vale et al., Curran et al, or JP 5-259804.

Features of the dependent claims are also not taught by the provided references for the reasons set forth above. In regard to claim 25, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein a length of the at least one upper electrode is dependent upon the position at which the film acoustic wave device is mounted on the wafer." None of the references teach or suggest changing the length of the upper electrode based on the location of the acoustical wave device on the wafer from which it was fabricated.

In regard to claim 26, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein a width of the upper electrode is dependent upon the position at which the film acoustic wave device is mounted on the wafer." For the same reasons set forth in claim 25, none of the applied references teach or suggest changing a characteristic, let alone a specific characteristic of an acoustical wave device based on its fabricated position on a wafer.

In regard to claim 27, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "a plurality of upper electrodes, and wherein distances between each of the plurality of upper electrodes is dependent upon the intended position of the semiconductor substrate on the wafer." For the same reasons set forth above, the distance between electrodes is not taught or suggested by the references based on the location of the acoustical wave device on the wafer.

In regard to claim 28, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest a step of "connecting the at least one upper electrode to a bonding pad, and wherein a shape of the bonding pad is dependent upon the intended position of the semiconductor substrate on the wafer."

In regard to claim 28, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein an area covered by the bonding pad is

dependent upon the intended position of the semiconductor substrate on the wafer."

In regard to claim 30, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest steps of "connecting the at least one upper electrode to a bonding pad; and connecting the at least one upper electrode and the bonding pad to a connecting pattern, wherein a shape of the connecting pattern is dependent upon the intended position of the semiconductor substrate on the wafer."

In regard to claim 31, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein a length of the connecting pattern is dependent upon the intended position of the semiconductor substrate on the wafer."

In regard to claim 32, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein a width of the connecting pattern is dependent upon the intended position of the semiconductor substrate on the wafer."

In regard to claim 33, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest steps of "connecting the at least one upper electrode to a bonding pad; and connecting the at least one upper electrode and the bonding pad to a connecting pattern, wherein the connecting pattern is formed with an air bridge."

In regard to claim 40, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "an inductor is intended to be formed between the semiconductor substrate and the ground electrode."

In regard to claim 61, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein the varied characteristic of the piezoelectric thin film is thickness."

In regard to claim 62, Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest "wherein the piezoelectric thin film is thicker in the middle of the wafer and becomes thinner as it extends out towards the periphery of the wafer."

Therefore, Krishnaswamy, Vale, Curran and JP 5-259804 each do not teach the claimed features as recited in Appellants' claimed combinations.

I. Claim 34 is not properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Krishnaswamy, Vale, Curran and Japanese Pat. App. No. 5-259804 in view of Berlincourt

In regard to claim 34, the Office Action admits that Krishnaswamy, Vale, Curran and JP 5-259804 each fail to teach or suggest a step of "forming a capacitor on the same semiconductor substrate as the film acoustic wave device, wherein a capacitance of the capacitor is dependent upon the intended position of the semiconductor substrate on the wafer." The rejection instead relies on Berlincourt to teach the missing claimed element. Applicants submit,

however, that Berlincourt fails to at least make up for the deficiency of not teaching or suggesting a wafer wherein at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer.

J. Claims 35-39, 61, and 62 are not properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Krishnaswamy, Vale, Curran and Japanese Pat. App. No. 5-259804

The Office Action admits that the references do not explicitly teach or suggest the claimed elements and instead relies on Official Notice. Applicants submit that at least for reasons above for claim 24, that the rejection fails to establish *prima facie* obviousness for claims 35-39, 61, and 62, as well.

IX. Conclusion

Based on the reasons set forth above, the rejections of claims 24-40, 61, and 62 under 35 U.S.C. §102 and 35 U.S.C. §103 should be REVERSED. As shown in the foregoing arguments, the claimed features of the present invention are not disclosed or suggested in the cited documents. As such, the documents do not anticipate the claimed invention. Accordingly, since the rejection of the claims is improper, reversal of the rejection is respectfully requested.

Docket No. 2565-0225P

Application No. 09/778,872

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. 1.16 or under 37 C.F.R. 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH STEWART KOLASCH & BIRCH, LLP

By:

Michael K. Mutter
Registration No. 29,680

MKM/CJB/sjl:cb RWA

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

APPENDIX OF CLAIMS

24. (Once Amended) A wafer having a plurality of acoustic wave devices formed thereon and exhibiting common operational characteristics, each of said acoustical wave devices manufactured according to a method comprising:

(a) forming a ground electrode on the wafer which is intended to be placed on top of a semiconductor substrate;

(b) forming a piezoelectric thin film on top of the ground electrode, wherein the piezoelectric thin film varies in at least one characteristic across the wafer; and

(c) forming at least one upper electrode on top of the piezoelectric thin film,

wherein at least the ground electrode, the piezoelectric thin film and the at least one upper electrode form components, as a result of steps (a)-(c), in each of the plurality of acoustical wave devices, and

wherein at least one component in some of the plurality of acoustical wave devices is modified in its operational characteristic to compensate for the variation in the at least one characteristic of the piezoelectric thin film and is based on the location of the at least one acoustical wave device on the wafer.

25. (Once Amended) The wafer according to claim 24, wherein a length of the at least one upper electrode is dependent upon the intended position of the semiconductor substrate on the wafer.

26. (Once Amended) The wafer according to claim 24, wherein a width of the at least one upper electrode is dependent upon the intended position of the semiconductor substrate on the wafer.

27. (Once Amended) The wafer according to claim 24, wherein the step of forming at least one upper electrode forms a plurality of upper electrodes, and

wherein distances between each of the plurality of upper electrodes is dependent upon the intended position of the semiconductor substrate on the wafer.

28. (Once Amended) The wafer according to claim 24, wherein said step (c) further includes a step,

(c1) connecting the at least one upper electrode to a bonding pad, and

wherein a shape of the bonding pad is dependent upon the intended position of the semiconductor substrate on the wafer.

29. (Once Amended) The wafer according to claim 28, wherein an area covered by the bonding pad is dependent upon the intended position of the semiconductor substrate on the wafer.

30. (Once Amended) The wafer according to claim 24, wherein said step (c) further includes steps,

(c1) connecting the at least one upper electrode to a bonding pad; and

(c2) connecting the at least one upper electrode and the bonding pad to a connecting pattern,

wherein a shape of the connecting pattern is dependent upon the intended position of the semiconductor substrate on the wafer.

31. (Once Amended) The wafer according to claim 30, wherein a length of the connecting pattern is dependent upon the intended position of the semiconductor substrate on the wafer.

32. (Once Amended) The wafer according to claim 30, wherein a width of the connecting pattern is dependent upon the intended position of the semiconductor substrate on the wafer.

33. (Once Amended) The wafer according to claim 24, wherein said step (c) further includes steps,

(c1) connecting the at least one upper electrode to a bonding pad; and

(c2) connecting the at least one upper electrode and the bonding pad to a connecting pattern,

wherein the connecting pattern is formed with an air bridge.

34. (Once Amended) The wafer according to claim 24, wherein the method according to which the device is manufactured includes a step,

(d) forming a capacitor on the same semiconductor substrate as the film acoustic wave device,

wherein a capacitance of the capacitor is dependent upon the intended position of the semiconductor substrate on the wafer.

35. (Once Amended) The wafer according to claim 24, wherein the semiconductor substrate is made of gallium arsenide (GaAs); the piezoelectric thin film is made of lead titanate ($PbTiO_3$); and the at least one upper electrode is a conductor substantially made of platinum (Pt).

36. (Once Amended) The wafer according to claim 24, wherein the semiconductor substrate is made of silicon (Si); the piezoelectric thin film is made of lead titanate ($PbTiO_3$); and the at least one upper electrode is a conductor substantially made of Platinum (Pt).

37. (Once Amended) The wafer according to claim 24, wherein the piezoelectric thin film is made of PZT ($PbTiO_3$-$PbZrO_3$); and the at least one upper electrode and the ground electrode is a conductor substantially made of platinum (Pt).

38. (Once Amended) The wafer according to claim 24, wherein the piezoelectric thin film is made of zinc oxide (ZnO).

39. (Once Amended) The wafer according to claim 24, wherein the piezoelectric thin film is made of aluminum nitride (AlN).

40. (Once Amended) The wafer according to claim 24, wherein an inductor is intended to be formed between the semiconductor substrate and the ground electrode.

61. The wafer of claim 24, wherein the varied characteristic of the piezoelectric thin film is thickness.

62. The wafer of claim 24, wherein the piezoelectric thin film is thicker in the middle of the wafer and becomes thinner as it extends out towards the periphery of the wafer.